

WHAT IS CLAIMED IS:

1. A method for creating a nucleic acid comprising the steps of:
- (a) annealing at least one primer nucleic acid to at least one template nucleic acid,
 - (b) performing a first extension by extending the primer nucleic acid employing the template nucleic acid to form an extended nucleic acid,
 - (c) denaturing the extended nucleic acid from the template nucleic acid,
 - (d) annealing the extended nucleic acid to at least a second template nucleic acid,
 - (e) performing a second extension by extending the extended nucleic acid employing the second template nucleic acid to form a twice extended nucleic acid,
 - (f) adding at least one chain-terminating agent comprising at least one dideoxynucleotide, a dideoxynucleotide analog or a dideoxynucleotide derivative before or during at least one of the first extension or the second extension, wherein said chain-terminating agent is incorporated into said extended nucleic acid, and
 - (g) modifying or removing the chain-terminating agent from the extended nucleic acid, if a further extension is to be performed.

2. The method of claim 1, further comprising:

(a) denaturing the twice extended nucleic acid from the second template nucleic acid

(b) annealing the twice extended nucleic acid to a third template nucleic acid, and

(c) performing a third extension by extending the twice extended nucleic acid employing the third template nucleic acid to form a thrice extended nucleic acid.

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3. The method of claim 2, further comprising adding least one chain-terminating agent comprising at least one dideoxynucleotide, a dideoxynucleotide analog or a dideoxynucleotide derivative before or during the third extension.

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4. The method of claim 2, further comprising at least one additional series of denaturing from a template, annealing to a further template, and performing of extension.

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5. The method of claim 4, further defined as comprising between one and about five hundred additional series of denaturing from a template, annealing to a further template, and performing of extension.

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6. The method of claim 2, further comprising adding least one chain-terminating agent comprising at least one dideoxynucleotide, a dideoxynucleotide analog or a dideoxynucleotide derivative before or during each extension.

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7. The method of claim 2, wherein at least one extension is performed without the addition of a chain-terminating agent.

8. The method of claim 1, wherein the at least one template nucleic acid and the second template nucleic acid have the same sequence.

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9. A method for creating a nucleic acid comprising the steps of:

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(a) ~~annealing at least one first primer nucleic acid to at least one first template nucleic acid,~~

(b) performing a first extension by extending the first primer nucleic acid employing the first template nucleic acid to form a first extended nucleic acid

(c) denaturing the first extended nucleic acid from the first template nucleic acid,

(d) annealing the first extended nucleic acid to at least a second template nucleic acid, and

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(e) performing a second extension by extending the extended nucleic acid employing the second template nucleic acid to form a twice extended nucleic acid,

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(f) adding at least one chain-terminating agent before or during at least one of the first extension or the second extension, and

(g) modifying or removing the chain-terminating agent from the extended nucleic acid, if a further extension is to be performed.

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10. The method of claim 9, wherein said chain-terminating agent comprises at least one dideoxynucleotide, a dideoxynucleotide analog or a dideoxynucleotide derivative.

5 11. The method of claim 9, wherein said chain-terminating agent is incorporated into said extended nucleic acid.

12. The method of claim 9, further comprising:

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(a) denaturing the twice extended nucleic acid from the second template nucleic acid

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(b) annealing the twice extended nucleic acid to a third template nucleic acid, and

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(c) performing a third extension by extending the twice extended nucleic acid employing the third template nucleic acid to form a thrice extended nucleic acid.

13. The method of claim 12, further comprising adding at least one chain-terminating agent before or during the third extension.

25 14. The method of claim 12, further comprising at least one additional series of denaturing from a template, annealing to a further template, and performing of extension.

30 15. The method of claim 14, further defined as comprising between one and five hundred additional series of denaturing from a template, annealing to a further template, and performing of extension.

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16. The method of claim 12, further comprising having at least one chain-terminating agent present before or during each extension.

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17. The method of claim 12, wherein at least one extension is performed without the addition of a chain-terminating agent.

18. The method of claim 9, wherein said chain-terminating agent is removed by at least one exonuclease.

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19. The method of claim 9, wherein said at least one first template nucleic acid or said at least one second template nucleic acid vary in size, sequence, resistance to cleavage or resistance to exonuclease degradation.

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20. The method of claim 9, wherein said at least one first template nucleic acid or said at least one second template nucleic acid are identical.

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21. The method of claim 9, wherein said method produces a plurality of extended nucleic acids.

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22. The method of claim 21, wherein said plurality of extended nucleic acids comprises an extension ladder.

23. The method of claim 21, wherein said plurality of extended nucleic acids vary in length, sequence, resistance to cleavage or resistance to exonuclease degradation.

5 24. The method of claim 23, wherein said plurality of extended nucleic acids comprises nucleic acids of different sequence.

10 25. The method of claim 24, wherein said different sequence varies by one nucleotide.

15 26. The method of claim 23, wherein said plurality of extended nucleic acids comprise different lengths.

20 27. The method of claim 26, wherein said different lengths comprise one nucleotide increments.

25 28. The method of claim 27, wherein said different lengths comprise more than one nucleotide increments.

29. The method of claim 9, wherein the extended nucleic acid comprises at least one partly double stranded nucleic acid or at least one fully double stranded nucleic acid.

30 30. The method of claim 9, wherein said at least one first primer nucleic acid comprises a sequence designed to anneal to a specific sequence comprising said first or second template nucleic acid.

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31. The method of claim 9, wherein said at least one first primer nucleic acid is resistant to cleavage or exonuclease digestion.

32. The method of claim 9, wherein said at least one first primer nucleic acid is a plurality of primers.

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33. The method of claim 32, wherein said plurality of primers vary in length, sequence, resistance to cleavage or resistance to exonuclease degradation.

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34. The method of claim 9, wherein the extended nucleic acid comprises the primer nucleic acid.

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35. The method of claim 9, wherein said extended nucleic acid is a recombinant, mutagenized or chimeric nucleic acid.

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36. The method of claim 9, wherein said at least one first template nucleic acid or said at least one second template nucleic acid is a plurality of template nucleic acids.

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37. The method of claim 9, further comprising the addition of at least one length-altering agent.

38. The method of claim ~~37~~, wherein the length-altering agent comprises a nucleotide, a nucleotide derivative, a nucleotide analog, a chemical treatment or a combination thereof.

39. The method of claim 38, wherein said length-altering agent comprises a nucleotide incorporated into said extended nucleic acid.

40. The method of claim 39, wherein said nucleotide comprises at least one ribonucleotide.

41. The method of claim 40, wherein said length-altering agent further comprises treatment with an alkaline condition or a ribonuclease.

42. The method of claim 40, wherein said length-altering agent further comprises treatment with alkaline phosphatase and an exonuclease.

43. The method of claim 38, wherein said length-altering agent comprises a nucleotide derivative incorporated into said extended nucleic acid.

44. The method of claim 38, wherein the length-altering agent comprises a nucleotide analog incorporated into said extended nucleic acid.

45. The method of claim 44, wherein said nucleotide analog comprises at least one α -phosphorothioate nucleotide.

46. The method of claim 45, wherein said length-altering agent further comprises alkylation of said extended nucleic acid.

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47. The method of claim 38, wherein the length-altering agent comprises a chemical treatment of said extended nucleic acid.

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48. The method of claim 47, wherein said chemical treatment is a Maxam and Gilbert treatment or variant thereof.

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49. A nucleic acid produced by the method of claim 9.

50. A proteinaceous composition encoded by a nucleic acid produced by the process of claim 9.

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51. The proteinaceous composition of claim 50, wherein said proteinaceous composition comprises an enzyme.

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52. The proteinaceous composition of claim 50, wherein said proteinaceous composition comprises a protein, a polypeptide or a peptide.

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53. A method for creating a nucleic acid comprising the steps of:

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54. (a) annealing at least one primer nucleic acid to at least one template nucleic acid,
- 5 (b) performing a first extension by extending the primer nucleic acid employing the template nucleic acid to form an extended nucleic acid,
- (c) denaturing the extended nucleic acid from the template nucleic acid,
- 10 (d) annealing the extended nucleic acid to at least a second template nucleic acid,
- (e) performing a second extension by extending the extended nucleic acid employing the second template nucleic acid to form a twice extended nucleic acid,
- 15 (f) adding at least one length-altering agent before or during at least one of the first extension or the second extension, and
- (g) modifying or removing the length-altering agent from the extended nucleic acid, if a further extension is to be performed.
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54. The method of claim 53, wherein said length-altering agent comprises at least one ribonucleotide incorporated into said extended nucleic acid.

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55. The method of claim 53, wherein said length-altering agent comprises at least one nucleotide analog incorporated into said extended nucleic acid followed by alkylation of said extended nucleic acid.

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